SOIL CONSERVATION DIGEST

U. S. Department of Agriculture
Soil Conservation Service
Region 10
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Dear Cooperator:

A Farm Bureau and a farm adviser recently asked for help in stopping the loss of soil and soil fertility in their county. Early settlers raised good crops of barley and wheat, but now a two-year rotation of fallow and grain is necessary. Even under this cropping system, yields are decreasing and soil and water losses are increasing.

NOT AN ISOLATED CASE

There are many areas in California where this is happening, and not on grain land alone. What can be done about it? What are you doing about it? It has been stated that soil conservation and soil fertility are inseparable. Let's look at the problem and see what can be done.

Actual practice the world over has proved that loss of soil fertility follows continued farming to a single annual crop. Practice has also shown that soil fertility can be maintained while crops are being produced by returning to the soil as much plant food in the form of organic matter and fertilizer as is removed by the crops produced.

CONTOUR TILLAGE

Contour tillage is a key practice in erosion control. It should be practiced on all sloping, clean-tilled land in the winter in addition to other soil conservation measures that may be used. If a sloping field is plowed, planted, and cultivated on the contour or level during the rainy season, each row and plow-furrow serves as an impediment to the downward rush of runoff water. When the rainwater is kept on the area on which it falls, no soil or water loss is incurred. When the direction of cultivation is not on the contour, the rows and furrows serve as small drainage ditches, hastening the removal of rainwater from the fields. When water is speeded up, its capacity to carry soil with it is greatly increased.

One would probably not consider it very serious if topsoil was being lost from his land at a rate of less than 2 tons per acre each year. At this rate it would take about 500 years to lose all of the topsoil to a depth of 6 inches if no soil building occurred. Soil building could be accomplished at this rate. But if the rate of loss is twenty times as great, and it frequently is, amounting to 40 tons of topsoil per acre each year, the expense of soil building would be prohibitive and all of the 6 inches of topsoil would be lost in 25 years. It is evident that contour tillage, when properly done, ranks in value with crop rotation or terracing as a soil conserving practice.

THE WATER GOES IN

If muddy water runs over the soil surface, the minute pores or "sieve openings" of the soil are clogged. Tillage is important in breaking up this "seal" and allowing the water to pass more quickly to deeper layers.

The rate of percolation to greater depths is governed also by the structure and condition of the subsoil. Deep contour tillage (subsoiling and plowing) is one method of getting rainwater down quickly to the second and even the third foot of soil and thus preventing its accumulation at the surface. It is probable that more evaporation losses occur on deep-tilled soil, but erosion is reduced by this practice and the run-off water saved will likely be more than this loss.

BASIN-LISTING

In the last several years, many improvements have been made on implements for safely tilling the soil. One of these is the basin-lister. The furrows made by the basin-lister on moderate slopes usually hold all the rain that falls.

With the basin-lister set to make furrows 36 inches apart and 8 inches deep, and with lams at 8-foot intervals, there will be over 1600 basins per acre. On a 10% slope, each of these basins will have a theoretical capacity of 2.9 cubic feet. Under field conditions, irregularities in slope, soil condition, and the difficulty in always keeping on a true contour will reduce the "safe" capacity of the basins considerably. Allowing 25% for this reduction, however, the basins will still constitute reservoirs for about one-acre inch of water from each rain in addition to that absorbed by the soil during the storm.

Runoff records indicate that in many cases enough water may be saved to produce a small green-manure crop and leave sufficient moisture stored in the soil for the succeeding summer crop. Also, it has been observed in several parts of California, that basin-listing has been particularly effective, saving nearly 100% of the rainwater on fields upon which green manure or other organic matter has been regularly incorporated into the soil. This is due to the greatly increased rate of moisture penetration into the soils containing organic matter.

The use of the basin-lister is practicable on most soils on slopes up to 10 percent. Its use on somewhat steeper slopes will depend upon the soil type, the organic matter content, and whether or not other soil and moisture conserving practices such as growing a winter green-manure crop, terracing, and subsoiling accompany or precede the basin-listing.

SEEDERS COMBINED WITH BASIN-LISTER

When basin-listing and cover crops are to be combined, a change is necessary in seeding methods. Large seeds should be broadcast before the land is basin-listed and the small seeds sown afterwards. This does not need to increase the cost of treating the land in this way, since a

seeder may be attached directly in front of the basin-lister to sow the large seeds and another seeder may be mounted on the frame of the basin-lister to scatter the small seeds. In this way, the seeding and basin-listing may be done all in one operation. Since the depth of the furrows can be controlled, the seed can be covered to about the desired depth, as well as spaced at suitable intervals.

SUBSOILING AND PLOWSOLES

Contour subsoiling conserves rainwater and prevents erosion by increasing the rate of moisture penetration. This is especially true where there is an impervious plowsole beneath the topsoil.

Subsoiling is most desirable on fields which have a definite plowsole, a heavy B-horizon or clay layer within two feet of the surface. The subsoiler is used only on dry land and breaks up the soil into large clods, so that rainwater can reach and be absorbed in the second and third foot of soil.

WHEN NOT TO SUBSOIL

On soils with a thick, heavy-textured subsoil and on shallow soils overlying bed-rock, subsoiling on steep slopes may cause slides or slips and do more damage than good. Such soils can be more safely protected by winter cover crops or other vegetative cover.

The average distance between the subsoiler furrows is about 3 to 5 feet on cultivated land, and the depth to which the points go vary from 12 to 24 inches. Subsoiling should always be as nearly on a true contour as possible to secure the maximum benefits. Be careful that they and the small field gullies do not form a drainage system. When the subsoiler furrows are not level, they will lead the water into old filled-in gullies and draws which will be reopened, thus causing more damage.

The purpose of contour subsoiling, contour furrows, contour basin-listing, deep plowing, and other deep tillage operations on the contour is to keep the rainwater where it falls and thereby take advantage of nature's even distribution of water over the field. This will result in erosion control, increased yields of crops, and possibly more even stands.

PASTURE FURROWING

The use of a subsoiler, or specially designed furrower in pastures, has been found practical in many states. The small ridges formed are spaced close together (15 to 20 feet) and provide effective checks to the movement of water down gentle slopes. The furrows should be staked on the exact contour at 1/10 to 1/4 the recommended terrace spacings for the same slope, and depending upon the permeability of the subsoil, the degree of erosion, and the condition of cover. The first furrows are made at the top of the slope as in terracing, and water from any field above diverted from them. If small gullies or depressions occur, the furrows should not cross them and the ends of the furrows should be turned up the slope. When, and if, the field is plowed for cultivation, the furrows are easily plowed out.

If burnet, alfalfa, or sweet clover is planted along the furrows, their value is increased. The roots of these plants are large and go deep into the soil, aiding materially in opening up the subsoil. The roots which remain in the soil constitute approximately 30% of the entire weight of sweet clover plants and when they decay, they provide large channels for percolating rainwater.

DISCING AND WINTER GREEN-MANURE CROPS

On dry-farmed land, a cover or green-manure crop cannot be established until the land is wet by rain. To get the earliest possible cover, however, such land may be disced dry and seeded before the rains start. Thus, the seed starts as soon as sufficient moisture is received and the cover crop has a start of two or three weeks. The contour cultivation will reduce runoff from early rains falling on crusted soil, and an early growth of vegetation will further hold the soil and slow the runoff water.

While each tillage practice discussed contributes to soil and water conservation, it should be recognized that the use of no one tillage operation will permanently control erosion any more than following one simple cropping practice will permanently maintain soil fertility.

--Paul B. Dickey